

ATTACHMENT D

Contents of a Nutrient Management Plan and Technical Standards for Nutrient Management for Dairies with Manure Anaerobic Digester or Co-digester Facilities

Owners and operators of dairies with anaerobic digesters or co-digesters (Dischargers) seeking coverage under Waste Discharge Requirements General Order No. R5-2010-XXXX (Order) requires owners and operators of dairies with anaerobic digesters or co-digesters (Dischargers) who have received a Notice of Applicability for the order and who apply manure, or digestate as a soil amendment, or process wastewater to land for nutrient recycling to develop and implement management practices that control nutrient losses and that are described in a Nutrient Management Plan (NMP). The purpose of the NMP is to budget and manage the nutrients applied to the land application area(s) considering all sources of nutrients, crop requirements, soil types, climate, and local conditions in order to prevent adverse impacts to surface water and groundwater quality. The NMP must take the site-specific conditions into consideration in identifying steps that will minimize nutrient movement through surface runoff or leaching past the root zone.

The NMP must contain, at a minimum, all of the elements listed below under Contents of a Nutrient Management Plan and must be in conformance with the applicable Technical Standards for Nutrient Management (Technical Standards), also listed below. Note that the NMP must be updated in response to changing conditions, monitoring results, and other factors.

A specialist who is certified in developing nutrient management plans shall develop the NMP. A certified specialist is a Professional Soil Scientist, Professional Agronomist, or Crop Advisor certified by the American Society of Agronomy or a Technical Service Provider certified in nutrient management in California by the Natural Resources Conservation Service (NRCS). The Executive Officer may approve alternative proposed specialists. Only NMPs prepared and signed by these parties will be considered certified.

The NMP is linked to other sections of the Order and accompanying Monitoring and Reporting Program (MRP). The MRP specifies minimum amounts of monitoring that must be conducted at the dairy digester or co-digester facilities. As indicated below, this information must be used to make management decisions related to nutrient management. Likewise, the timing and amounts of process wastewater applications to crops must be known to correctly calculate the amount of storage needed in holding ponds.

Wastes and land application areas must be managed to prevent contamination of crops grown for human consumption.

Contents of a Nutrient Management Plan

Dairy Facility Assessment

The NMP shall identify the name and address of the dairy with anaerobic digester or co-digesters facilities (Facility), the dairy and digester or co-digesters operators, and legal owners of the dairy property and digester or co-digesters facilities as reported in the Notice of Intent (NOI) and shall contain all of the following elements to demonstrate that the Discharger can control nutrient losses that may impact surface water or groundwater quality and comply with the requirements of the Order and the Technical Standards.

- I. Land Application Area Information
 - A. Identify each land application area (under the Discharger's control, whether it is owned, rented, or leased, to which manure, digestate, soil amendment, or process wastewater from the production area is or may be applied for nutrient recycling) on a single published base map (topographic map or aerial photo) at an appropriate scale which includes:
 1. A field identification system (Assessor's Parcel Number; land application area by name or number; total acreage of each land application area; crops grown; indication if each land application area is owned, rented, or leased by the Discharger; indication what type of waste is applied (solid manure, digestate, or soil amendment only, wastewater only, or both); drainage flow direction in each field, nearby surface waters, and storm water discharge points; tailwater and storm water drainage controls; subsurface (tile) drainage systems (including discharge points and lateral extent); irrigation supply wells and groundwater monitoring wells; sampling locations for discharges of storm water and tailwater to surface water from the field; and
 2. Process wastewater conveyance structures, discharge points and discharge mixing points with irrigation water supplies; pumping facilities; flow meter locations; drainage ditches and canals, culverts, drainage controls (berms, levees, etc.), and drainage easements.
 - B. Provide the following information for land application area identified in I.A above:

1. Field's common name (name used when keeping records of waste applications).
2. Assessor's Parcel Number.
3. Total acreage.
4. Crops grown and crop rotation.
5. Information on who owns and/or leases the field.
6. Proposed sampling locations for discharges of storm water and tailwater to surface water.

C. Identify each field under the control of the Discharger and within five miles of the dairy where neither process wastewater nor manure is applied. Each field shall be identified on a single published base map at an appropriate scale by the following:

1. Assessor's Parcel Number.
2. Total acreage.
3. Information on who owns, leases, or rents the field.

Note: The NMP must be updated and the Central Valley Water Board notified in writing before waste is applied to the lands identified in Section D.

II. Sampling and Analysis (see Technical Standard I below)

Identify the sampling methods, sampling frequency, and analyses to be conducted for soil, manure, digestate, soil amendment, process wastewater, irrigation water, and plant tissue analysis (Technical Standard I below).

III. Nutrient Budget (see Technical Standard V below)

The Discharger shall develop a nutrient budget for each land application area. The nutrient budget shall establish planned rates of nutrient applications for each crop based on soil test results, manure and process wastewater analyses, irrigation water analyses, crop nutrient requirements and patterns, seasonal and climatic conditions, the use and timing of irrigation water, and the nutrient application restrictions listed in Technical Standards V.A through V.D below. The Nutrient Budget shall include the following:

- A. The rate of application of manure, digestate, soil amendment, and process wastewater for each crop in each land application area (also considering other sources of nutrients) to meet each crop's needs without exceeding the application rates specified in Technical Standard V.B below. The basis for the application rates must be provided.
 - B. The timing of applications for each crop in each land application area and the basis for the timing (Technical Standard V.C below). The maximum period of time anticipated between land application events (storage period) based on proper timing and compliance with Technical Standard V.C. below. This will be used to determine the storage capacity needs.
 - C. The method of manure, digestate, soil amendment, and process wastewater application for each crop in each land application area (Technical Standard V.D below).
 - D. If phosphorus and/or potassium applications exceed the amount of these elements removed from the land application area in the harvested portion of the crop, the soil and crop tissue analyses shall be reviewed by an agronomist at least every five years. If this review determines that the buildup of phosphorus or potassium threatens to reduce the long-term productivity of the soil or the yield, quality or use of the crops grown, application rates will be adjusted downward to prevent or correct the problem.
- IV. Setbacks, Buffers, and Other Alternatives to Protect Surface Water (see Technical Standard VII below)
- A. Identify all potential surface waters or conduits to surface water that are within 100 feet of any land application area.
 - B. For each land application area that is within 100 feet of a surface water or a conduit to surface water, identify the setback, vegetated buffer, or other alternative practice that will be implemented to protect surface water (Technical Standard VII below).
- V. Field Risk Assessment (see Technical Standard VIII below)
- Evaluate the effectiveness of management practices used to control the discharge of waste constituents from land application areas by assessing the water quality monitoring results of discharges of manure, process wastewater, tailwater, subsurface (tile) drainage, or storm water from the land application areas.

VI. Record-Keeping (see Technical Standard IX below)

Identify the records that will be maintained for each land application area identified in I.A above.

VII. Nutrient Management Plan Review (see Technical Standard X below)

- A. Identify the schedule for review and revisions to the NMP.
- B. Identify the person who will conduct the NMP review and revisions.

Technical Standards for Nutrient Management

The Discharger shall comply with the following Technical Standards for Nutrient Management in the development and implementation of the Nutrient Management Plan (NMP).

I. Sampling and Analysis

Soil, manure, digestate, soil amendment, process wastewater, irrigation water, and plant tissue shall be monitored, sampled, and analyzed as required in Monitoring and Reporting Program No. R5-2010-XXXX, and any future revisions thereto. The results of these analyses shall be used during the development and implementation of the NMP.

II. Crop Requirements

- A. Realistic yield goals for each crop in each land application area shall be established. For new crops or varieties, industry yield recommendations may be used until documented yield information is available.
- B. Initially, each crop's nutrient requirements for nitrogen, phosphorus, and potassium may be determined based on recommendations from the University of California or *Western Fertilizer Handbook* (9th Edition). Once laboratory values are available, nutrient requirements shall be determined based on historical crop nutrient removal determined from laboratory values.

III. Available Nutrients

- A. All sources of nutrients (nitrogen, phosphorus, and potassium) available for each crop in each land application area shall be identified prior to land applications. Potential nutrient sources include, but are not limited to, manure, digestate, soil amendments, process wastewater, irrigation water, commercial fertilizers, and previous crops.
- B. Nutrient values of soil, manure, digestate, soil amendments, process wastewater, and irrigation water shall be determined based on laboratory analysis. "Book values" for manure and process wastewater may be used for planning of waste applications during the first two years during initial development of the NMP if necessary. Acceptable book values are those values recognized by American Society of Agricultural and Biological Engineers (ASABE), the Natural Resources Conservation Service (NRCS), and/or the University of California that

accurately estimate the nutrient content of the material. The nutrient content of commercial fertilizers shall be derived from California Department of Food and Agriculture published values.

- C. Nutrient credit from previous legume crops shall be determined by methods acceptable to the University of California Cooperative Extension, the NRCS, or a specialist certified in developing nutrient management plans.

IV. Overall Nutrient Balance

If the NMP shows that the nutrients generated by the dairy and anaerobic digester or co-digesters exceed the amount needed for crop production in the land application area, the Discharger must implement management practices (such as offsite removal of the excess nutrients, treatment, or storage) that will prevent impacts to surface water or groundwater quality due to excess nutrients.

V. Nutrient Budget

The NMP shall include a nutrient budget which includes planned rates of nutrient applications for each crop that do not exceed the crop's requirements for total nitrogen considering the stage of crop growth and that also considers all nutrient sources, climatic conditions, the irrigation schedule, and the application limitations in A through D below.

A. General Standards for Nutrient Applications

1. Prohibition A.7 of the Order: *"The application of waste to lands not owned, leased, or controlled by the Discharger without written permission from the landowner or in a manner not approved by the Executive Officer, is prohibited."*
2. Land Application Area Specification C.5 of the Order: *"The application of waste to the land application area shall be at rates that preclude development of vectors or other nuisance".*
3. Land Application Specification C.6 of the Order: *"All process wastewater applied to land application areas must infiltrate completely within 72 hours after application.."*
4. Plans for nutrient management shall specify the form, source, amount, timing, and method of application of nutrients on each land application area to minimize nitrogen and/or phosphorus movement

to surface and/or ground waters to the extent necessary to meet the provisions of the Order.

5. Where crop material is not removed from the land application area, waste applications are not allowed. For example, if a pasture is not grazed or mowed (and cuttings removed from the land application area), waste shall not be applied to the pasture.
6. Manure and/or process wastewater will be applied to the land application area for use by the first crop covered by the NMP only to the extent that soil tests indicate a need for nitrogen application.
7. Supplementary commercial fertilizer(s) and/or soil amendments may be added when the application of nutrients contained in manure, digestate, soil amendment, and/or process wastewater alone is not sufficient to meet the crop needs, as long as these applications do not exceed provisions of the Order.
8. Nutrient applications to a crop shall not be made prior to the harvest of the previous crop except where the reason for such applications is provided in the NMP.
9. Water applications shall not exceed the amount needed for efficient crop production.
10. Nutrients shall be applied in such a manner as not to degrade the soil's structure, chemical properties, or biological condition.

B. Nutrient Application Rates

1. General

- a. Planned rates of nutrient application shall be determined based on soil test results, crop tissue test results, nutrient credits, manure and process wastewater analysis, crop requirements and growth stage, seasonal and climatic conditions, and use and timing of irrigation water. Actual applications of nitrogen to any crop shall be limited to the amounts specified below.
- b. Nutrient application rates shall not attempt to approach a site's maximum ability to contain one or more nutrients through soil adsorption. Excess applications or applications that cause soil imbalances should be avoided. Excess manure nutrients generated by the Discharger must be

handled by export to a good steward of the manure, or the development of alternative uses.

2. Nitrogen

- a. Total nitrogen applications to a land application area prior to and during the growing of a crop will be based on pre-plant or pre-side dress soil analysis to establish residual nitrogen remaining in the field from the previous crop to establish early season nitrogen applications. Pre-plant or side dress nitrogen applications will not exceed the estimated total crop use as established by the nutrient management plan. Except as allowed below, application rates shall not result in total nitrogen applied to the land application areas exceeding 1.4 times the nitrogen that will be removed from the field in the harvested portion of the crop. Additional applications of nitrogen are allowable if the following conditions are met:
 - i. Plant tissue testing has been conducted and it indicates that additional nitrogen is required to obtain a crop yield typical for the soils and other local conditions;
 - ii. The amount of additional nitrogen applied is based on the plant tissue testing and is consistent with University of California Cooperative Extension written guidelines or written recommendations from a professional agronomist;
 - iii. The form, timing, and method of application facilitates timely nitrogen availability to the crop; and
 - iv. Records are maintained documenting the need for additional applications.
- b. If application of total nitrogen to a land application area exceeds 1.4 times total nitrogen removed from the land application area through the harvest and removal of the previous crop, the Discharger shall either revise the NMP to immediately prevent such exceedance or submit a report demonstrating that the application rates have not and will not pollute surface or ground water.

3. Phosphorus and Potassium

- a. Phosphorus and potassium may be applied in excess of crop uptake rates. If, however, monitoring indicates that levels of these elements are causing adverse impacts, corrective action must be taken. Cessation of applications may be necessary until crop uptake and harvest has reduced the concentration in the soil.

Important Note:

Use of animal manure as a primary source of nitrogen commonly results in applications of phosphorus and potassium at rates that exceed crop needs. Over time, these elements build up in the soils and can cause adverse impacts. For example, phosphorus will leave the land application area in surface runoff and contribute to excessive algae growth in receiving waters and potassium can build up in crops to the point of limiting their use as animal feed. Application of these nutrients at agronomic levels, along with reasonable erosion control and runoff control measures, will normally prevent such problems.

Nutrients are being evaluated in several Central Valley surface waters. Where these studies show that nutrients are adversely impacting beneficial uses, the Regional Water Board will work with parties in the watershed, including dairies, to reduce discharges of phosphorus, nitrogen and possibly other constituents.

C. Nutrient Application Timing

1. Process wastewater application is not the same as irrigation. Process wastewater application scheduling should be based on the nutrient needs of the crop, the daily water use of the crop, the water holding capacity of the soil, and the lower limit of soil moisture for each crop and soil.
2. Wastewater shall not be applied when soils are saturated. During the rainy season rainfall can exceed crop water demand. However, the application of wastewater is allowable if tests show that there is an agronomic need and current conditions indicate that threat of nitrate leaching is minimal.
3. The timing of nutrient application must correspond as closely as possible with plant nutrient uptake characteristics, while

considering cropping system limitations, weather and climatic conditions, and land application area accessibility.

4. Nutrient applications for spring-seeded crops shall be timed to avoid surface runoff and leaching by winter rainfall.

D. Nutrient Application Methods

1. The Discharger shall apply nutrient materials uniformly to application areas or as prescribed by precision agricultural techniques.
2. Land Application Area Specification C.11 of the Order: "*Land application areas that receive dry manure, digestate, and process wastewater shall be managed to minimize erosion.*"

VI. Wastewater Management on Land Application Areas

Control of water and process wastewater applications and runoff is a part of proper nutrient management since water transports nutrients, salts, and other constituents from cropland to groundwater and surface water. The Discharger shall comply with the following provisions of the Order, which place requirements on applications of manure and process wastewater to, and runoff from, cropland:

- A. Prohibition A.3 of the Order: "*The discharge of waste from a milk cow dairy, dairy manure digester, or co-digester which causes or contributes to an exceedance of any applicable water quality objective in the appropriate Basin Plans or any applicable state or federal water quality criteria, or a violation of any applicable state or federal policies or regulations is prohibited.*"
- B. Prohibition A.4 of the Order: "*The collection, treatment, storage, discharge, or disposal of wastes at an existing milk cow dairy, dairy manure digester, or co-digester operation that results in (1) discharge of waste constituents in a manner which could cause degradation of surface water or groundwater except as allowed by this Order, (2) contamination or pollution of surface water or groundwater, or (3) a condition of nuisance (as defined by the California Water Code Section 13050) is prohibited.*"
- C. Prohibition A.13 of the Order: "*The discharge of wastewater to surface waters from cropland without a NPDES permit is prohibited.*"

- D. Prohibition A.14 of the Order: *“Discharges of storm water to surface water from the land application area where manure, process wastewater, or liquid or solid waste produced by a digester has been applied is prohibited unless the land application area has been managed consistent with a certified Nutrient Management Plan.”*
- E. Land Application Area Specification C.3 of the Order: *“Land application of wastes for nutrient recycling from the dairy and/or digester/co-digester operations shall not cause the underlying groundwater to contain any waste constituent, degradation product, or any constituent of soil mobilized by the interactions between applied wastes and soil or soil biota, to exceed the groundwater limitations set forth in this Order.”*
- F. Land Application Area Specification C.5 of the Order: *“The application of waste to the land application area shall be at rates that preclude development of vectors or other nuisance.”*
- G. Land Application Area Specification C.6 of the Order: *“All process wastewater applied to land application areas must infiltrate completely within 72 hours after application.”*
- H. Land Application Area Specification C.4 of the Order: *“Application of all process wastewater, manure, and digestate to the land application area shall be conducted in accordance with a NMP prepared by a specialist who is certified in developing NMPs. A copy of the NMP bearing the signature of the certifier shall be kept at the facility to be available for review at all times by site-operational personnel and Central Valley Water Board inspectors. The NMP shall reflect actual crops grown at the facility, the actual form of nutrients and non-nutrient salts applied to each field, and reasonable application rates. The NMP shall be submitted to the Central Valley Water Board upon request by the Executive Officer.”*
- I. Land Application Area Specification C.10 of the Order: *“Annual calculations showing the total nitrogen, phosphorus, potassium, and non-nutrient salts applied to each field, including from sources other than dry waste or wastewater is required. These calculations will be used to annually modify the NMP if revisions are needed to bring the facility into compliance with the Order.”*

VII. Setbacks and Vegetated Buffer

- A. Land Application Area Specification C.8 of the Order: *“Wastes shall not be applied closer than 100 feet to any down gradient surface waters unless: a 35-foot wide vegetated buffer or physical barrier is substituted for the 100-foot setback; or an alternative conservation practice or field-specific condition is demonstrated to provide pollutant reductions equivalent to or better than the reductions achieved by the 100-foot setback.”*
- B. Land Application Area Specification C.9 of the Order: *“Wastes shall not be applied closer than 100 feet to open tile line intake structures, sinkholes, or agricultural or domestic well heads unless the Discharger has submitted an adequate demonstration that alternative practices will be as protective as the 100-foot separation. Because of its technical nature the demonstration of equivalent protection must be prepared by a California licensed professional engineer or professional geologist with experience in hydrogeology.”*
- C. A setback is a specified distance from surface waters or potential conduits to surface waters where manure and process wastewater may not be land applied, but where crops may continue to be grown.
- D. A vegetated buffer is a narrow, permanent strip of dense perennial vegetation where no crops are grown and which is established parallel to the contours of and perpendicular to the dominant slope of the land application area for the purposes of slowing water runoff, enhancing water infiltration, trapping pollutants bound to sediment, and minimizing the risk of any potential nutrients or pollutants from leaving the land application area and reaching surface waters.
- E. The minimum widths of setbacks must be doubled around the wellhead of a drinking water supply well constructed in a sole-source aquifer.
- F. Practices and management activities for vegetated buffers include the following:
 - 1. Removal of vegetation in vegetated buffers will be in accordance with site production limitations, rate of plant growth, and the physiological needs of the plants.
 - 2. Do not mow below the recommended height for the plant species.
 - 3. Maintain adequate ground cover and plant density to maintain or improve filtering capacity of the vegetation.

4. Maintain adequate ground cover, litter, and canopy to maintain or improve infiltration and soil condition.
5. Periodic rest from mechanical harvesting may be needed to maintain or restore the desired plant community following episodic events such as drought.
6. When weeds are a significant problem, implement pest management to protect the desired plant communities.
7. Prevent channels from forming.

VIII. Field Risk Assessment

The results of the water quality monitoring of discharges of manure, digestate, soil amendments, process wastewater, storm water, and tailwater to surface water from each land application area, as required by Monitoring and Reporting Program No. R5-2010-XXXX, shall be used by the Discharger to assess the movement of nitrogen and phosphorus from each land application area.

IX. Record-Keeping

The Discharger shall maintain records for each land application area as required in the Record-Keeping Requirements of Monitoring and Reporting Program No. R5-2010-XXXX.

X. Nutrient Management Plan Review

- A. Provide the name and contact information (including address and phone number) of the person who created the NMP; the date that the NMP was drafted; the name, title, and contact information of the person who approved the final NMP; and the date of NMP implementation.
- B. The NMP shall be updated when discharges from any land application area exceed water quality objectives, a nutrient source has changed, site-specific information has become available to replace default values used in the overall nutrient balance or the nutrient budget, nitrogen application rates in any land application area exceed the rates specified in Technical Standard V.B or management practices are not effective in minimizing discharges.

- C. The NMP shall be updated prior to any anticipated changes that would affect the overall nutrient balance or the nutrient budget such as, but not limited to, a crop rotation change, changes in the available cropland, or the changes in the volume of process wastewater generated.
- D. The Discharger shall review the NMP at least once every five years and notify the Central Valley Water Board in the annual report of any proposed changes that would affect the NMP.